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FACTS ABOUT PESTICIDES AND PESTICIDE RESIDUES

What do we really mean when we talk about pests and pesticides? Putting it at its simplest, pests are those organisms we don't like. Pests are those species that compete with us for food, inflict injury on us, or even just annoy us. Expanding just a bit further, pests are those organisms that have a negative effect on our crop plants and other desirable vegetation or on our domestic animals, our favored wildlife species, and water resources.

At one end of the experience spectrum pests are annoying. At the other--as the causes of pestilence, famine, and disease--they are deadly. Most people equate pests with insects. As troublesome as these organisms can be when uncontrolled, they are by no means the only threats to man's well-being. Fungi, viruses, bacteria, weeds, nematodes, rodents, and other organisms are also destructive when left unchecked.

There are times when these pests must be controlled. And, as all of us have become increasingly aware during the past decade, they must be controlled without undue damage to the environment on which we all depend. A pesticide is any chemical used to kill, control, or diminish in some way those organisms that threaten man.

Pesticides are divided into the following categories:

* Insecticides protect growing and stored crops from insect damage and destruction, protect people and animals from annoying or disease-carrying insects, and protect shelters and structures from destruction by insects.

* Herbicides control unwanted vegetation, either selectively or generally.

* Fungicides and bactericides protect plants or seeds from infection by fungi and bacteria that cause molds, rots, and blights.

* Rodenticides control rats, mice, and other rodent pests that destroy food and feed crops and transmit diseases.

* Nematicides control plant-parasitic nematodes, which are microscopic worms that live in the soil or in plant roots and cause stunting and debilitation of plants.

* Molluscicides control snails and slugs.

Just how does a pesticide work? It may work in several ways. For example, most insecticides must get inside the bug to be effective. If the target insect eats plant leaves, a chemical can be applied to the leaves to serve as a stomach poison. If the insect sucks the juice from plants, the insecticide can be applied to the soil, be picked up by the plant roots, and moved systemically through the plant; as the insect sucks the plant juices, the insecticide is ingested until a toxic level is reached.

A contact insecticide is one that the insect touches either through direct application or by means of a residue on a surface such as a plant leaf or the kitchen floor. The insecticide must penetrate the insect's body. Once in the body it may be directly toxic or changed into chemical compounds toxic to the insect. These can kill both eating and sucking insects.

Insects, with their rapid reproduction and high potential for genetic modification, are an adaptable lot. Therefore, pesticide scientists labor continuously to monitor the development of insect resistance to previously effective compounds and to develop new approaches to controlling these pests.

Weeds present a different kind of problem. In the typical agricultural acre, the weed seed population is about 200 million. Over the centuries, weed control has evolved from hand-pulling, to hoe, to animal drawn or mechanized cultivators, to herbicides.

Perhaps nowhere in the pesticide family is selectivity as important or as highly developed as it is in modern herbicides. The ability of these chemicals to kill weeds without harming the crop has contributed to the high agricultural yields we now take for granted. A mere three-quarters of a pound of herbicide properly applied to a soybean field can make the difference between a weed-ravaged field and a bountiful harvest. Some herbicides are effective at even lower dosages.

Herbicides may be classed several ways. First, some are contact herbicides that kill or stunt growth after contact. Growth-regulator type herbicides are absorbed and moved through weed tissues following application either to the foliage of the plant or to the soil. Soil-active types are designed for control of weeds before they can get started from the seed.

While we've been able to control some plant diseases we've merely learned to live with many others. Fungi cause leaf spots, rusts, mildews, smuts, cankers, and most blights and rots. But fungicides too must be selectively toxic in order not to damage the plants while attacking the fungi.

Nematodes are highly destructive worms that feed by piercing plant tissues, often the roots, with a hollow spear through which they suck the plant's vital juices, causing it to develop slowly and become stunted and susceptible to disease.

Soil fumigants are the most commonly used nematicides. These are toxic to plants and must be applied well before planting time. However, research approaches to chemical control of nematodes include evaluation of nonfumigant materials, which may be applied on and around the plants to kill the pests as they attack the roots.

What is a Pesticide Residue?

A pesticide residue is the remnant of a pesticide that is found on or in a crop or commodity after application or other exposure to the chemical. It may or may not be the same chemical as applied due to modification or breakdown as a result of natural processes such as weathering or biological reactions. Residues may result from a direct application, drift, up-take from contaminated soil, or from other environmental sources. Residues are usually expressed in parts per million (ppm) on a weight basis. For example, 1 ounce of pesticide residue in 1 million ounces of a raw agricultural commodity is 1 ppm. This is equivalent to a penny in $10,000.

Within the past few years improved equipment and techniques for pesticide residue analysis have made possible the detection of amounts and types of a considerable number of pesticides at levels approaching 0.001 ppm, which is 1 part per billion (ppb).

A residue tolerance is simply the amount of a pesticide, including its toxic degradation products, that scientists have determined may safely remain as a residue on or in a food item or in water without injury to the consumer. The tolerance is specific for the pesticide and the crop. It is set by the Environmental Protection Agency and enforced by the Federal Food and Drug Administration.

Factors Affecting Residues

Some factors that influence the persistence of a chemical and the possibility that residues may remain are:

* The amount of chemical applied.

* The chemical structure.

* The formulation.

* The pH; i.e., the acidity or alkalinity of the diluent used as a carrier.

* The nature of the surface to which it is applied.

* Exposure to weathering from wind and rain.

* Chemical breakdown from high temperatures and humidity.

* Photochemical reactions from sunlight.

* The length of time the chemical is exposed to these factors.

* Normal kitchen practices or various food processing procedures, such as peeling, washing, and cooking which usually reduce the amount of residue remaining on food before it is consumed.

Time Intervals Affect Residue on Crops

If time intervals, dosages, and other directions are followed carefully as specified on the label, there should be no residue on or in the crop in excess of the legal safe tolerance.

Pesticide labels provide the applicator with time intervals required between application of a pesticide to the plant or animal and the date of harvest, milking, or slaughter. Examples are: "Do not apply later than 14 days before harvest" or "Do not apply within 21 days of slaughter." The number of applications permitted during a given time interval may also be specified.

Effects of Residues on Health

Much has been written about human and livestock intake of pesticides from foods and feeds, as well as storage of these compounds in their bodies and their effects on health.

Tolerances for pesticide chemicals are established in the United States so that pesticide chemicals can be used effectively, and when needed, in the production of food without harm to the consumer. A tolerance (or legal residue) does not mean that all foods will contain residues at the tolerance limit when the food is harvested and shipped. Data on thousands of shipments of food examined for compliance with tolerances show that although a majority of the shipments contained detectable amounts of one or more pesticide residues, no residues were found in many lots of food. A majority of the residues reported were at very low levels and relatively few exceeded legal tolerances.

Further evidence of the low levels of pesticide residues consumed by the American public was obtained from total diet studies conducted by the U.S. Food and Drug Administration to discover the quantity of pesticides in all kinds of food and drink consumed daily. These studies showed that all pesticides detected were at very low levels and only seven of 24 possible chlorinated pesticide residues were found., No residues of organophosphorus pesticides were detected at established detection levels.

Pesticides are necessary to protect our crops and livestock from pests. Without them our food supply would be inadequate. When used properly, they are safe, effective, and provide for high quality and wholesome food.